

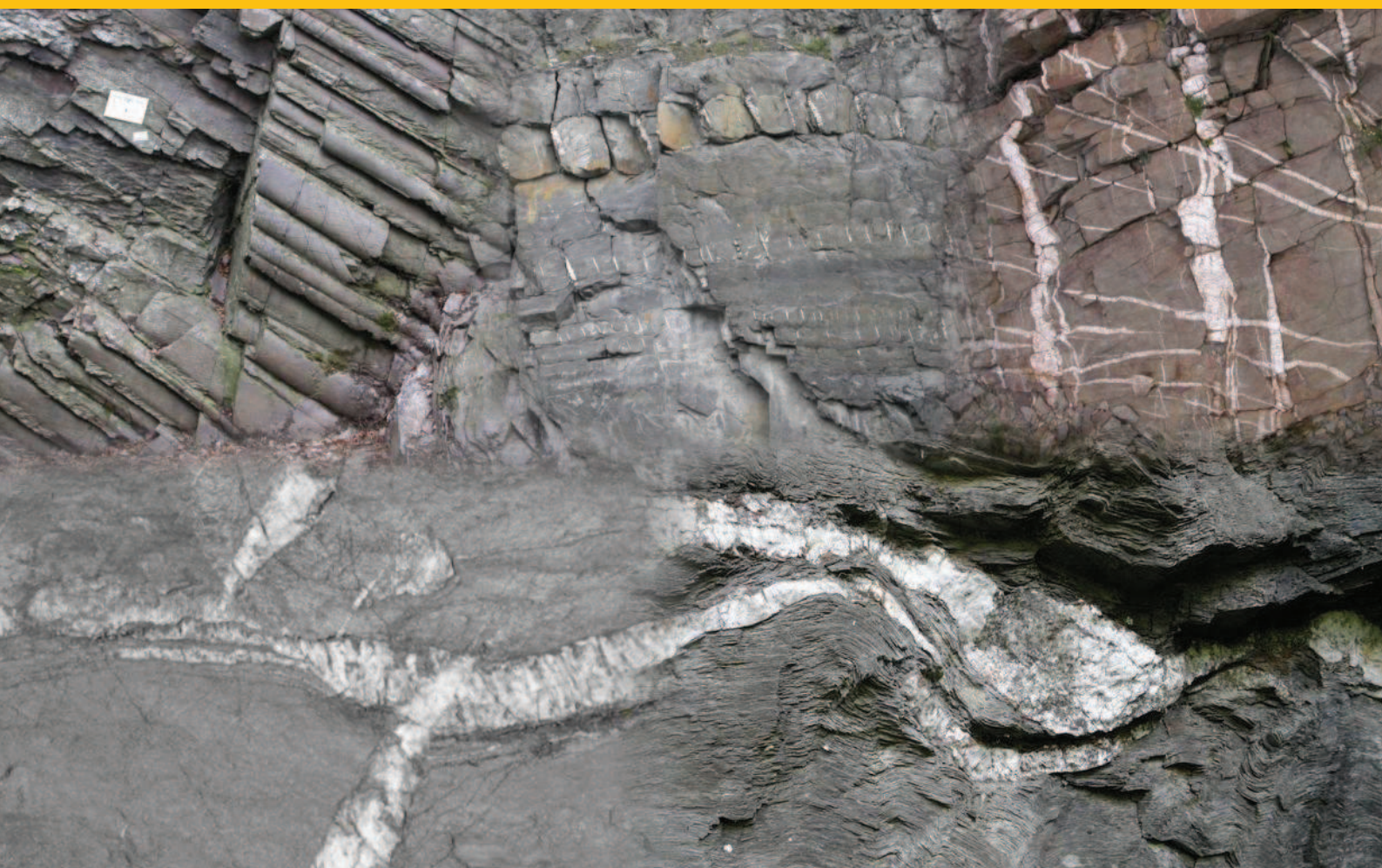
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Identifying the influence of the metamorphic mineralogy on the magnetic fabric of the Ordovician slates in the Stavelot-Venn basement inlier, Belgium

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The anisotropy of magnetic susceptibility (AMS) is an intrinsic rock property related to the orientation distribution of the rock-forming minerals. However, (semi-)quantitative correlations between AMS (described by the corrected degree of anisotropy P_j and the shape parameter T) and the mineral preferred orientation remain ambiguous because AMS is also governed by the rock's mineralogical composition.

In this study, we perform an integrated low- and high-field AMS, mineralogical and geochemical analysis on Ordovician slates that are exposed in the Stavelot-Venn basement inlier, in the south-east of Belgium. The section is dominated by a large recumbent, synclinal fold with an axial planar cleavage – the Lienne syncline. Rocks of the Jalhay Formation (formerly known as Salmian 1, Sm1) are exposed in the northern and southern limb, while rocks of the Ottré Formation (formerly known as Salmian 2, Sm2) occur in the hinge zone of the Lienne syncline.

Our results show that the magnetic fabric of the Sm1 samples is oriented parallel to the tectonic cleavage. However, we can discriminate between a triaxial fabric type (moderately positive T values) with the maximum principal susceptibility axis (K_1) coinciding with the bedding-cleavage intersection and a purely cleavage-parallel, oblate fabric type (high T values). The former is present in samples with a relatively large angle between bedding and cleavage whereas the latter is present in samples, for which bedding and cleavage are nearly parallel. Furthermore, the P_j and T parameters are influenced by the relative amount of diamagnetic (quartz and albite) and paramagnetic (biotite, white mica and chlorite) minerals. We explain this influence by the behavior of the non-platy quartz and albite minerals that disrupt the fabric development.

The magnetic fabric of the Sm2 samples is again consistently oriented parallel to the tectonic cleavage. Similar to the Sm1 samples, we can discriminate between truly oblate and more triaxial to even slightly prolate fabric types. However, in the case of the Sm2 samples, the variation in fabric can be attributed to a variable amount of antiferromagnetic hematite whose contribution cannot be separated from that of the paramagnetic minerals. The hematite minerals, oriented parallel to the cleavage, generate an inverse magnetic fabric with K_1 perpendicular to the cleavage. Hence, samples with a high hematite content will have a less flattened (or even a slightly prolate) magnetic fabric. Furthermore, the P_j and T parameters are again influenced by the relative amount of diamagnetic (quartz and albite) and paramagnetic-antiferromagnetic (biotite, white mica, chlorite, chloritoid and hematite) minerals because the former disrupt the fabric development.

So, mineralogical variations within both types of Ordovician slates (Sm1 and Sm2), as well as a variation in the bedding-cleavage angle (in the case of Sm1 slates), have a profound impact on the AMS of these slates. The structural position within the recumbent syncline, on the other hand, does not seem to have any major influence on the magnetic fabric. The AMS of these rocks cannot be used as a (semi)-quantitative proxy for the mineral fabric and hence, their tectonic deformation.